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A new subspecies of *Ornithoptera paradisea* Staudinger, 1893 (Lepidoptera, Papilionidae)

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Abstract The authors describe a new subspecies of *Ornithoptera paradisea* Staudinger from the Lake Kutubu area, Southern Highlands Prov., Papua New Guinea.

Key words Papilionidae, *Ornithoptera paradisea*, *demeter*, new subspecies, Lake Kutubu, Papua New Guinea

Lake Kutubu is located in the central part of Southern Highlands Province, Papua New Guinea, which is a part of the south side of the huge and long mountain-system which runs west to east in the center of the island New Guinea. The elevation of the Lake Kutubu area is *ca* 1,000 m. According to Haugum & Low (1979), 4 males of *Ornithoptera paradisea* from this area have been recorded, but they were not well recognized nor examined.

Recently the authors examined 9 males and 6 females of *Ornithoptera paradisea* that were said to be from the Lake Kutubu area. As the specimens show some stable morphological characters in common, the authors have concluded that these males and females belong to a single breeding population that inhabits some part of the Lake Kutubu area. Furthermore, as some of those stable morphological characters are recognized as quite distinctive from those of the other known subspecies in male and female respectively, the authors describe a new subspecies of *Ornithoptera paradisea*, designating a male specimen out of the 9 males as holotype, and the rest of the examined specimens as paratypes, and one female of the paratypes as allotype. Both holotype and allotype are in the collection of one of the authors H. So.

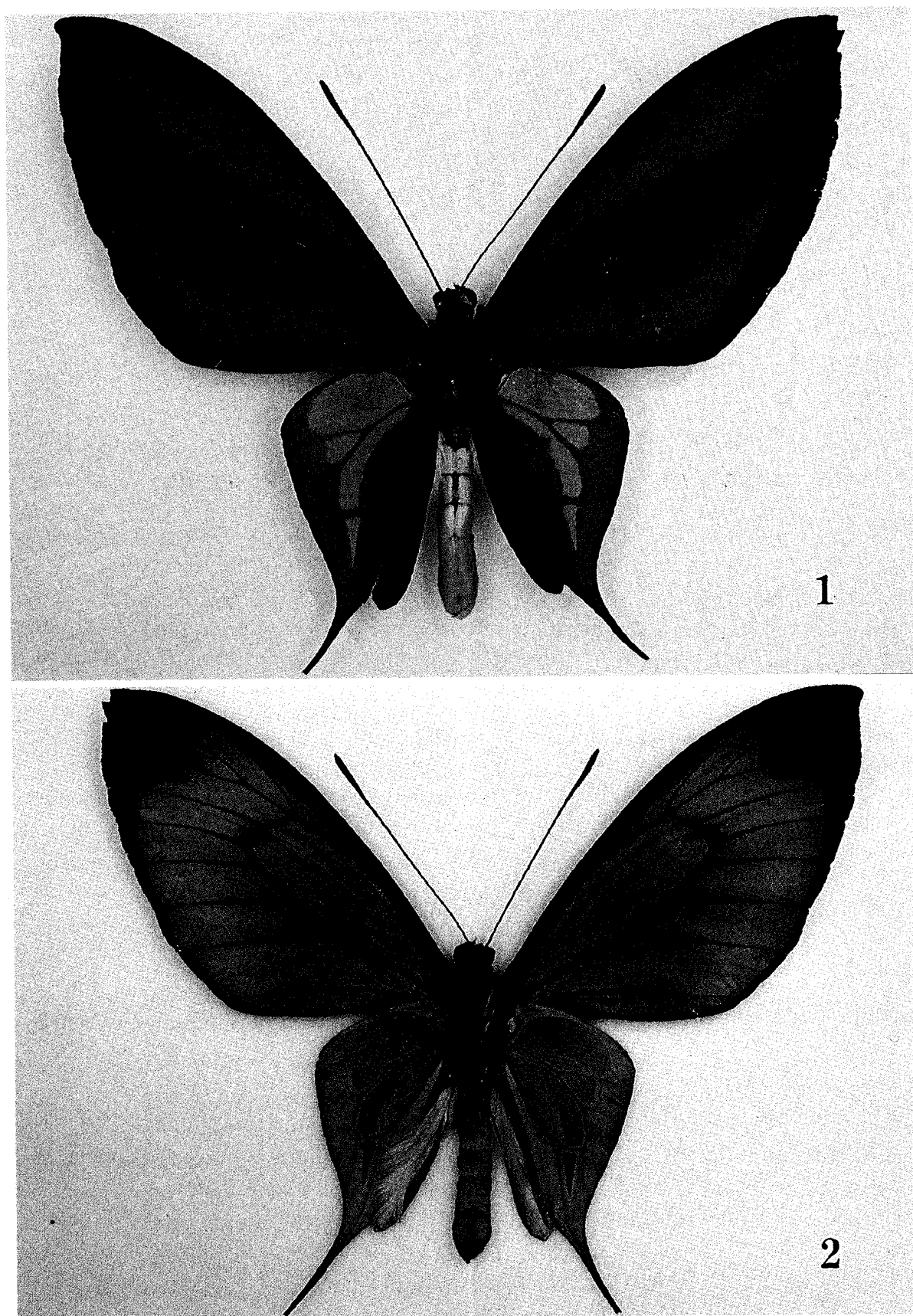
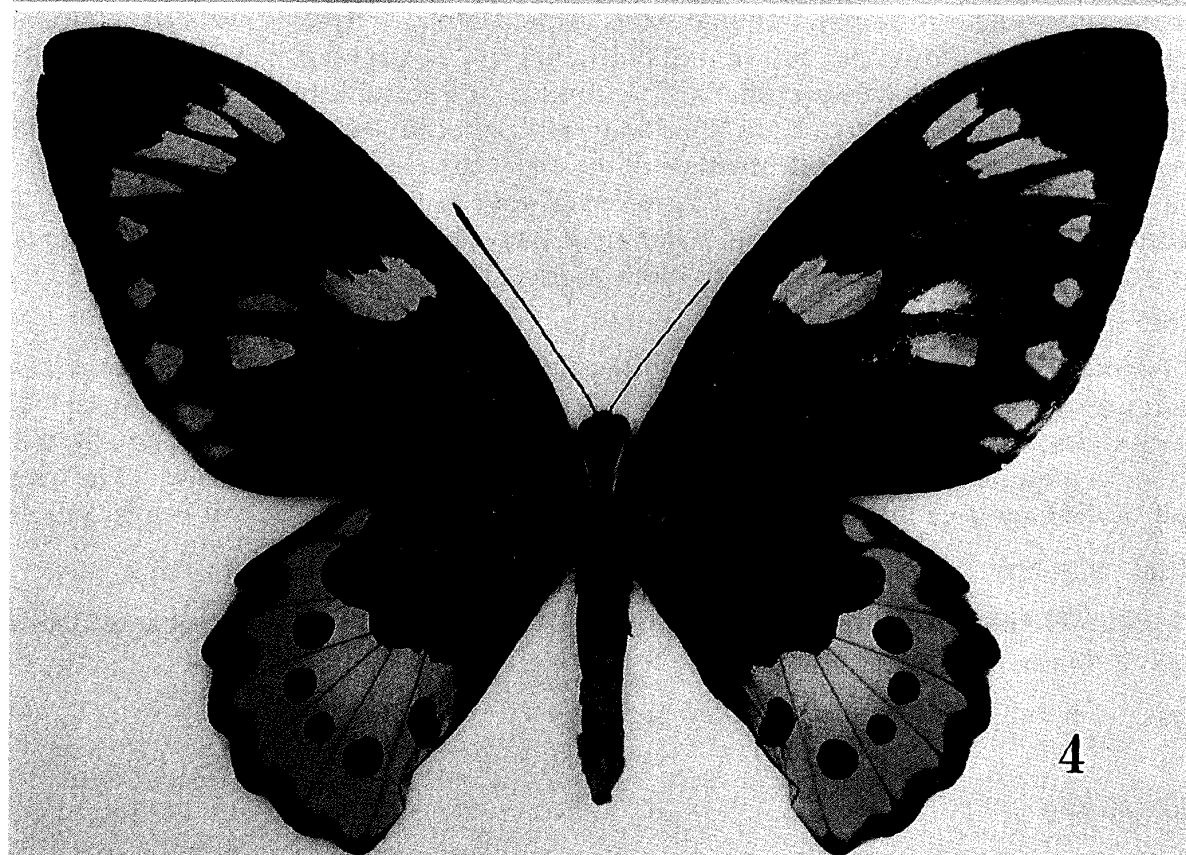
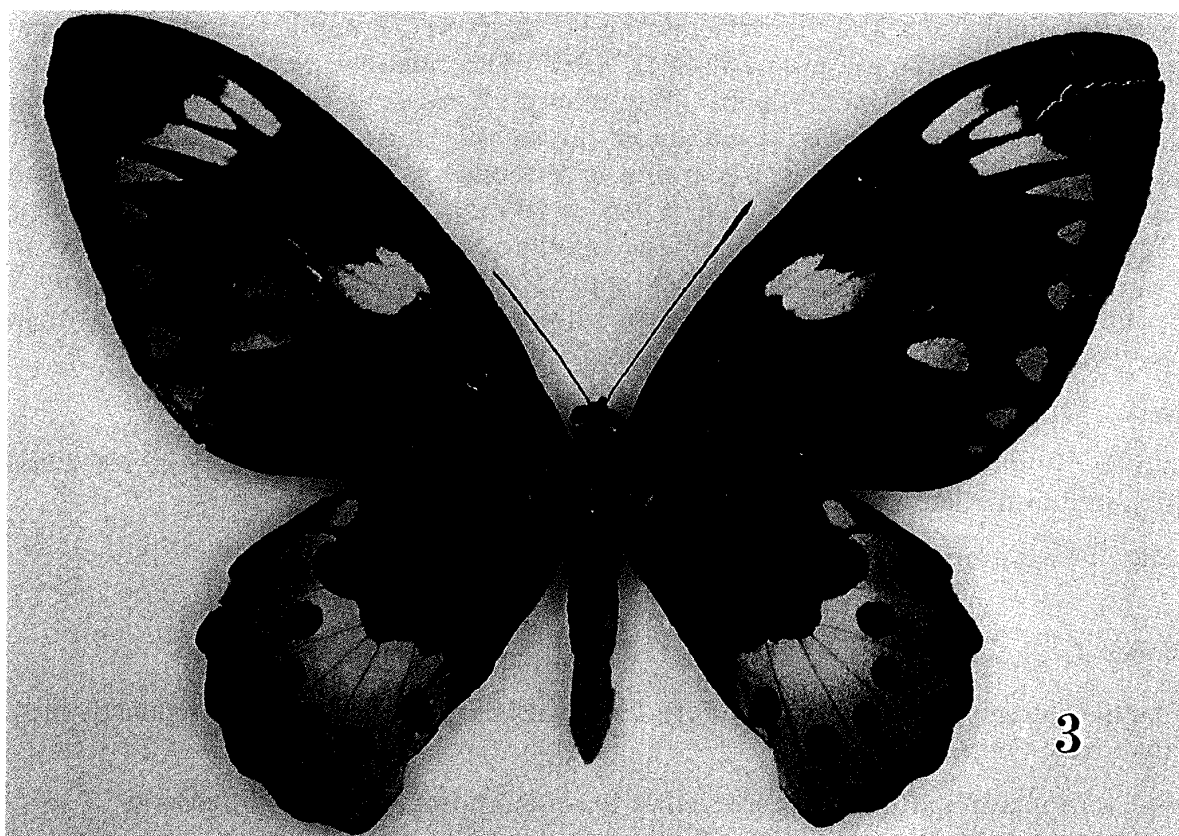
***Ornithoptera paradisea demeter* ssp. nov.** (Figs 1-4)

Male

Holotype. Male (Figs 1-2), Lake Kutubu, Southern Highlands Prov., Papua New Guinea.

Basic wing shape and markings are similar to other known subspecies in general.

Forewing. Length is 73 mm. Apex is somewhat pointed. Outer margin is slightly out-rounded. Ground color is velvety black. Three iridescent green bands are evenly and strongly greenish. Radial and cubital bands are relatively broad, and anal band is narrow and short (among paratypes there is one male which has rather longer anal band, but narrow). On the underside iridescent green scaling is developed and black scaling is limited as in the other races.

Hindwing. Apex is very slightly squared and outer margin is slightly out-rounded. Tail is narrow and long (the tips of the tails of holotype are damaged and missing). The inner base of the tail bears a small amount of iridescent green scales (one male paratype specimen lacks such scaling). Semi-translucent golden-yellow (=STGY) parts are very reduced in size and

Figs 1–2. *Ornithoptera (Schoenbergia) paradisea demeter* ssp. nov. Holotype ♂. 1. Upperside. 2. Underside. ×1.05.

Figs 3–4. *Ornithoptera (Schoenbergia) paradisea demeter* ssp. nov. Allotype ♀. 3. Upperside. 4. Underside. ×0.87.

appear only in the cells 2, 6, 7 and the discal cell. Each STGY part is separated widely and completely by the iridescent green scaling on veins. The iridescent green scaling forms rather wide belts between each STGY part. The iridescent green scale belt on the vein 7 is also wide and clear (this character is recognized among all examined male specimens). The iridescent green submarginal area is evenly wide though it is slightly wider in its center. Black marginal belt is narrower than in ssp. *arfakensis* but wider than in the nominate subspecies and ssp. *chrysanthemum*. The underside, as in the other races, has almost no black scaling but iridescent green scaling and STGY parts. The inner marginal area is covered with pale-silvery scales and has long white hair brush from wing base to anal angle. Tips of tails are black without iridescent green scaling.

Head. Covered with short black hair. Eye trimmed by short white hair.

Thorax. Top of the dorsal part is iridescent-green-colored. A small bunch of red hair is recognized at the lateral part of thorax near wing base.

Legs. Femora are covered with yellow scales.

Female

Allotype (paratype). Female (Figs 3–4), Lake Kutubu, 2,000 ft, Southern Highlands Prov., Papua New Guinea.

Basic wing shape and markings are similar to other known subspecies in general.

Forewing. Length is 88 mm. Overall wing shape is broad. Apex is rounded. Ground color is nearly blackish dark brown. Submarginal row of the small pale markings in the cells 1b to 4 are white to creamy white slightly covered with sporadic black scales. Subapical pale markings in the cells 5 to 8 are white and well-developed and covered very slightly with scattered black scales. The pale marking in the discal cell is well developed and white, and the outer part of the spot is slightly covered with very small amount of black scales. The developed pale markings in the cells 2 and 3 are also white and the outer parts of the spots are covered with very small amount of black scales. The underside is almost similar to the upperside.

Hindwing. Surface ground color is as in the forewing. The inner half of the large pale marking in submarginal area is white while outer half is light ocher and slightly covered with black scales. The discal cell has no pale marking. Round dark spots are present in the cells 1b to 5. Ground color of the underside is less dark than that of the upperside. The inner half of the large pale marking in submarginal area is white while outer half is light yellow.

Head. Covered with short black hair. Eye trimmed by short white hair.

Thorax. No iridescent-green-color recognized. A bunch of red hair is present at the lateral part of thorax near wing base.

Legs. Femora are covered with yellow scales.

Comparison

Five subspecies of *Ornithoptera (Schoenbergia) paradisea* have been described validly. They are: ssp. *paradisea*, ssp. *arfakensis*, ssp. *flavescens*, ssp. *borchi*, and ssp. *chrysanthemum*. Regarding to ssp. *borchi* and ssp. *flavescens*, the authors followed Ohya's (1983) treatment

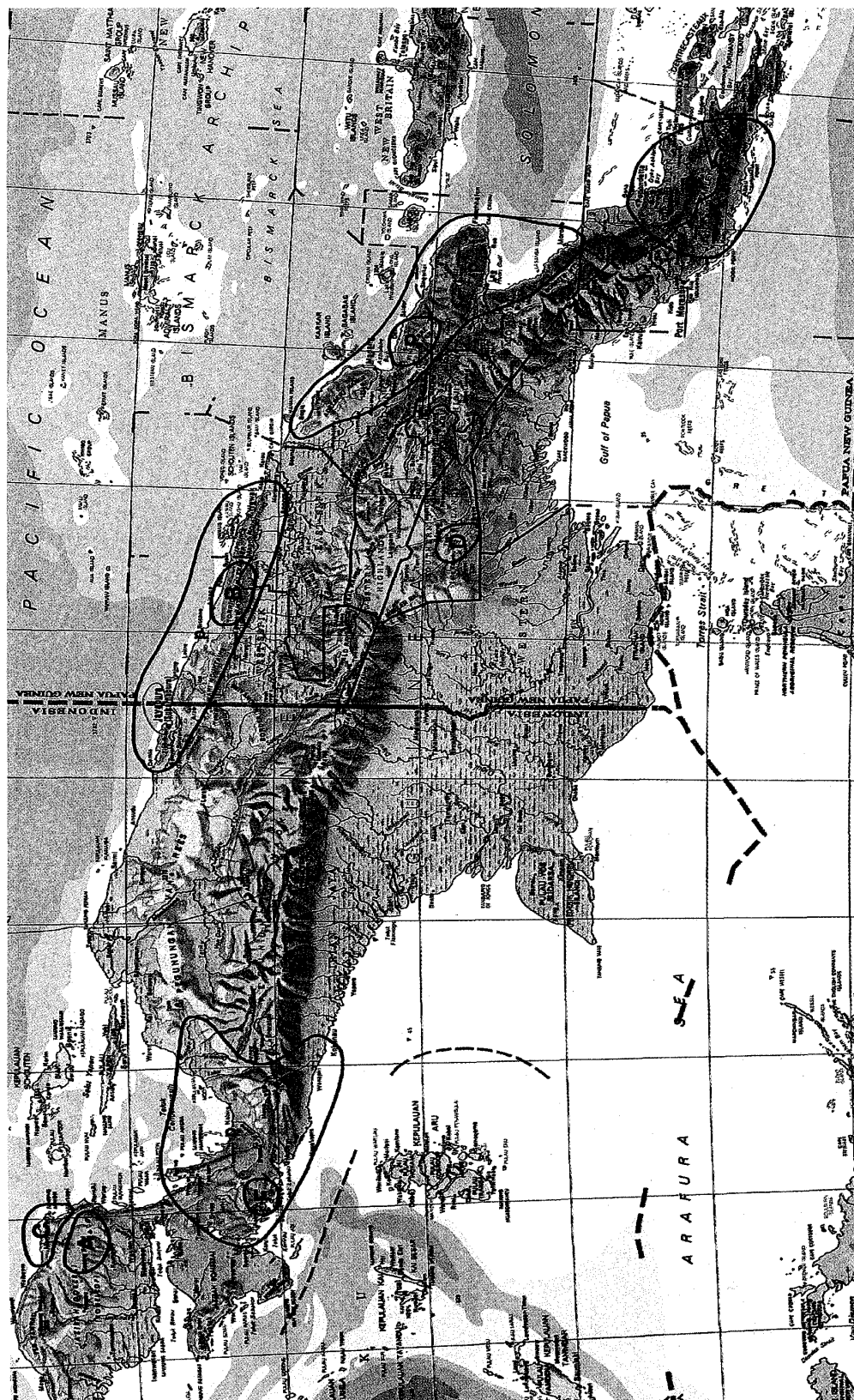



Fig. 5. A map of New Guinea showing the hypothetic distributional areas of the races of *Ornithoptera paradisea*. C. Ssp. *chrysanthemum*, type locality and its hypothetic distribution. A. Ssp. *arfakensis*, type locality and its hypothetic distribution. D. Ssp. *demeter* nov., type locality and its hypothetic distribution. P. Ssp. *paradisea*, type locality. p. *Ditto*, hypothetic distribution. F. Female form *flavescens*, type locality. B. Local form *borchi*, type locality.

Table 1. Diagnosis chart of *Ornithoptera (Schoenbergia) paradisea* subspecies.

	subspecies	*demeter*	*paradisea*	*chrysanthemum*	*arfakensis*
male	Shade of the radial band of forewing (=FW)	Evenly and strongly greenish iridescent green.	Evenly iridescent green.	Evenly iridescent green.	Iridescent green with golden shade in the apical part.
	Shape of hindwing (=HW)	Outer margin slightly out-rounded. Rounder than in ssp. *paradisea*.	Straight outer margin. Narrow triangular shape.	Outer margin slightly out-rounded. Rounder than in ssp. *paradisea*.	Outer margin is out-rounded. Roundest among all subspecies.
	Width of black marginal belt of HW	Medium.	Narrow.	Narrow.	Wide.
	Semi-translucent golden-yellow (=STGY) part and iridescent green (=IG) scales on veins of HW	STGY part is very reduced in size and divided into 4 parts. IG scaling is very developed and separates the 4 STGY parts widely and clearly. IG band on vein 7 is clear and wide.	STGY part is well developed and tends to fuse over veins. IG scales are not prominent in most examples.	STGY part is rather reduced in size. IG scaling is rather developed in many specimens, but still in most cases IG scaling on vein 7 is not well developed nor clear.	STGY part is developed in general. Development of IG scaling on veins is variable. Very few examples show wide IG belt on vein 7.
	Inner part of the base of the tails	IG scales are scarce or absent completely.	IG scales are well developed in general.	IG scales are present, but usualy small amount.	IG scale is absent completely.
	Length of the tails	Long.	Long.	Long.	Short.
	Femora	Covered with yellow scales.	Covered with yellow scales.	Covered with yellow scales.	Black.

female	Ground color	Nearly-blackish dark brown.	Brown to dark brown.	Blackish dark brown.	Blackish dark brown.
	The cell spot in FW	White and well-developed and covered only partialy with sporadic black scales.	Present but mal-developed. Creamy and covered partialy with black scales.	Absent in most example. Only very few examples with small white spot are recorded.	Well-developed and white. Covered partialy with black scales.
	Brush of pale scales towards apex from subapical pale markings in the cells 7 and 8 in FW	No such scaling or very little.	No such scaling.	Such scaling is very prominent.	No such scaling or very little.
	Large pale marking in HW	In the upperside inner part is white and outer part is light ocher covered with sporadic black scales. In the underside inner part is white and outer part is light yellow.	In the upperside inner part is creamy and outer part is light brown covered with sporadic dark brown scales. In the underside it is much similar to that in the upperside. A very few examples with yellow outer part and inner white part.	In the upperside whole marking is light yellow covered sporadically with black scales. In the underside it is yellow lacking such black scales.	In the upperside inner part is white and outer part is ocher color covered with sporadic black scales. In the underside such black scaling is absent.
	Submarginal black spot in the cell 6 in HW	Absent.	Absent.	Absent in most examples. Very few exeptions with small spot.	Well-formed.
	Pale part in the discal cell of HW	Absent.	Absent in most examples with very few exeptions that have small spot.	Absent.	Big white part.
	Femora	Covered with yellow scales.	Covered with yellow scales.	Covered with yellow scales.	Black.

considering them as a local form and a female form of the nominate subspecies respectively. Therefore the comparison is made with the following three subspecies. 1) ssp. *paradisea* : Original description and relatively small number of specimens are compared. The type locality is Finisterre Range. The specimens of f. loc. *borchi* are rather plenty in the collections which are from the mountain mass north of Sepik River. 2) ssp. *arfakensis* : Original description and relatively large number of specimens are compared. The credibility of type locality and validity of taxon are well acknowledged. Type locality is western Arfak Mts of Berau Penn., north-west New Guinea. 3) ssp. *chrysanthemum* : Original description and relatively large number of specimens are compared. The credibility of type locality and validity of taxon are also well acknowledged. Type locality is the "non-high altitude area near Manokwari", Berau Penn., north-west New Guinea. Male of the new subspecies is most similar, as a whole, to ssp. *chrysanthemum*. But it is distinguishable by the following characters : 1) Greenish shade of iridescent green coloration is stronger. 2) STGY parts in hindwing are much more reduced in size and they are four completely-separated parts. Each part is widely and completely separated by iridescent green scales on veins. 3) On vein 7 of ssp. *chrysanthemum* the band of iridescent green scales is not well-developed, and in most specimens of ssp. *chrysanthemum* STGY parts of the cells 6 and 7 are partially fused, but those of the new subspecies are completely separated. Comparison with other subspecies is shown in Table 1.

Female of the new subspecies is most similar, as a whole, to ssp. *arfakensis*. But it is distinguishable by the following characters : 1) The white discal cell spot in hindwing is absent. 2) Submarginal dark spot is absent in the cell 6. 3) Femora are covered with yellow scales. Comparison with other subspecies is shown in Table 1.

Etymology

"*Demeter*" is derived from the name of the goddess of agriculture and fertility in Greek myth.

Legal concerns

The 9 males and 6 females of *O. paradisea* from the Lake Kubutu area were legally imported into Japan with a valid CITES permission.

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摘　　要

ゴクラクトリバネアゲハの1新亜種（蘇　裕明・佐藤誠一郎）

著者らはパプアニューギニア中部のサザン・ハイランズ州のクツブ湖地域産とみられるゴクラクトリバネアゲハ，*Ornithoptera (Schoenbergia) paradisea* を新亜種として記載した．クツブ湖地域はパプアニューギニア島を東西に走る中央山塊の南側斜面の一部を形成する地域で，パプアニューギニアのサザン･ハイランズ州の中央部に位置する．標高は約1,000 m程．同地域からの *O. paradisea* は Haugum & Low (1979) によれば過去に合計4雄の記録があるようであるが，十分に検討されていない．最近著者らはクツブ湖地域産とみられる9雄6雌を検した結果，全ての被検個体において多くの共通かつ安定した形態的特徴を見い出したので，それらは同一地域の同一個体群に属するものと判断し，さらにそれらの特徴の内の幾つかは既知の諸亜種と安定的かつ明確に相違していると判断したので，同地産の *O. paradisea* を新亜種として記載した．上記の個体の内1雄をホロタイプに指定し，残余の被検個体をパラタイプに指定，さらに同パラタイプの内1雌をアロタイプに指定した．なお記載の正文は英語とするので下に和文に訳したものを掲載する．当ホロタイプ，アロタイプとも著者の一人蘇が所持する．

ホロタイプ．雄 (Figs 1-2)，クツブ湖，サザン・ハイランズ州，パプアニューギニア．

基本的な斑紋・翅形は既知の他亜種と同様．

前翅．基部から翅頂までの長さは73 mm．翅頂は尖り，外縁は幾分外側に丸く張り出す．地色はベルベット状の黒色，3つの金緑色紋は均一な金緑色．亜前縁帯と肘状帯は比較的広く，臀縁紋は細く短い（パラタイプの中には比較的長いものもあるが細い）．裏面は金緑紋の発達がよく，黒色条は狭い．

後翅．翅頂は少々角張り，外縁は極少し外側に張り出す．尾状突起は細く長い（ホロタイプ標本の尾状突起は両先端が破損欠落している）．尾状突起の基部内縁に少量から痕跡程度の金緑鱗粉が出現する（ただパラタイプの内1雄は同様の金緑鱗粉を全く欠く）．半透明黄金斑は第2, 6, 7及び中室に出現するが非常に減退し，それぞれの斑は翅脈上の金緑鱗粉により完全に広く相互に分離される．翅脈上の金緑鱗粉で形成される筋は幅広く明瞭な帯状になる．特に第7脈上の金緑鱗粉の筋も幅広く明瞭である（これは全ての被検個体に例外なく見られる）．外縁の金緑色帯は幅広く，中央部で少々広くなるが，その幅はほぼ均一．外縁黒帯は ssp. *arfakensis* よりは狭く，原名亜種と ssp. *chrysanthemum* よりは広い．裏面は他亜種と同様に黒色部が殆どなく，金緑鱗粉と半透明黄金斑のみになる．内縁部は銀灰色となり基部から肛角部にかけ長い白色毛がブラシ状に生じる．尾状突起の先端部分は金緑鱗粉を欠き黒色となる．

頭部．黒色で，複眼後縁に白色の縁取りが存在する．

胸部．上面には金緑斑点があり，側胸部の紅色毛はわずかに認められる．

腿節．黄色鱗粉を具える．

アロタイプ．雌 (Figs 3-4)，クツブ湖，2,000 ft，サザン・ハイランズ州，パプアニューギニア．

基本的な斑紋・翅形は既知の他亜種と同様．

前翅．基部から翅頂までの長さは88 mm．翅形は幅広く，翅頂は丸みを帯びている．表面の地色は黒に近い黒褐色．第1bから4室の小さい亜外縁斑列は白色から乳白色であるが表面に黒色鱗粉を散布し多少暗化する．第5から8室の大きい亜翅頂斑は白色で良く発達し極微量の黒色鱗粉を散布する．よく発達した中室紋は白色で外側に少々黒色鱗粉の散布がある．第2, 3室の比較的大きい翅室紋も白色で外側に少々黒色鱗粉の散布がある．裏面は表面とほぼ同様．

表 1. *Ornithoptera (Schoenbergia) paradisea* 各亜種の鑑別表.

	亜　種	***demeter***	***paradisea***	***chrysanthemum***	***arfakensis***
雄	前翅亜前縁帯の金緑色帯の色調	均一な濃い緑色の金緑色.	均一な金緑色.	均一な金緑色.	金緑色. 翅端部は黄金色を帯びる.
	後翅翅形	外縁部は外側に緩く張り出す. 原名亜種より丸みを帯びる.	外縁部は直線的. 翅形は細長い三角形的.	外縁部は外側に緩く張り出す. 原名亜種より丸みを帯びる.	外縁部は外側に張り出す. 翅形は丸みを帯びる. 全亜種中一番丸い.
	後翅外縁黒縁の幅	中間的.	狭い.	狭い.	広い.
	後翅半透明黄金部とそれを隔てる翅脈上の金緑色鱗粉	半透明黄金部は非常に減退して 4 個の紋になる. 翅脈上の金緑鱗粉は非常に発達し, それぞれの半透明黄金部は互いに広く明瞭に分離される. 特に第 7 脈上の金緑鱗粉の筋は幅広く明瞭である.	半透明黄金部は発達し, 翅脈を越えて融合する個体が多く, 翅脈上の金緑鱗粉の発達は悪いが, 多少とも出現する個体もある.	半透明黄金部はやや減退する傾向があるが, 個体変異も多い. 翅脈上の金緑鱗粉は良く発達する個体もあるが, その場合でも第 7 脈上の金緑鱗粉の筋は狭く明瞭でない.	半透明黄金部は基本的には発達する. 翅脈上の金緑色鱗粉の筋は細い線状のものから帯状まで変異が多い. 極めて少数ではあるが 7 脈上の金緑鱗粉の筋が幅広く明瞭な個体もある.
	後翅尾状突起基部内側	金緑鱗粉を少々散布する個体から欠落する個体まで変異あり.	金緑鱗粉散布, よく発達する個体も多い.	金緑鱗粉散布するが少量.	金緑鱗粉を全く欠く.
	後翅尾状突起形態	長い.	長い.	長い.	短い.
	腿節	黄色鱗粉あり.	黄色鱗粉あり.	黄色鱗粉あり.	黒色. 黄色鱗粉なし.

雌	翅地色	黒味の強い黒褐色.	褐色から黒褐色.	黒褐色.	黒褐色
	前翅中室白紋	明瞭に出現し，良く発達. 白色，黒色鱗粉散布少ない.	出現するも発達弱く乳白色，黒色鱗粉散布少々.	無いが，稀には小白斑の出現する個体あり.	出現し良く発達し白色，黒色鱗粉散布.
	前翅亜翅頂部第 7, 8 室白紋の流れ	流れ無し，もしくは極少々.	流れ無し.	外縁に向かって白色鱗粉流れが明瞭.	流れ無し，もしくは極少々.
	後翅亜外縁の大きな紋	翅表では外側は明るい黄土色で黒色鱗粉が散布し暗化する. 内側は白色. 裏面は外側が明るい黄色，内側は白色.	翅表は外側が淡褐色で黒褐色の鱗粉を散布し内側は乳白色. 裏面は表面と大差ないが少々明るい. 裏面の外側が明るい黄色になる個体もある.	翅表，裏面とも紋全体が鮮やかな黄色. 翅表は黒色鱗粉が少しのるため多少黒く見える.	翅表では外側は黄土色で黒色鱗粉が散布され暗化し，内側は白色. 裏面は外側が明るい黄色で，内側は白色.
	後翅亜外縁大紋内の第 6 室の黒点	無し.	無し.	無し. しかし稀に小斑点がでる個体あり.	有り.
	後翅中室紋	紋無し.	紋無し. 稀に小白斑あり.	紋無し.	大きな白斑あり.
	腿節	黄色鱗粉あり.	乳白色鱗粉あり.	黄色鱗粉あり.	黒色. 黄色鱗粉無し.

後翅．表面の地色は前翅同様．亜外縁帯の大きな紋は内側が白色，外側は明るい黄土色で表面に黒色鱗を散布し多少暗化する．中室には白紋を欠く．第1bから5室の亜外縁部に黒褐色の円形斑が出現する．裏面の地色は表面より少々黒みが少なく，亜外縁帯の大きな紋は内側が白色，外側は明るい黄色．

頭部．黒色で，複眼後縁に白色の縁取りが存在する．

胸部．上面には金緑斑点は無く，側胸部に紅色毛を認める．

腿節．黄色鱗粉を具える．

既知の諸亜種との比較

5亜種 (ssp. *paradisea*, ssp. *arfakensis*, ssp. *flavescens*, ssp. *borchi*, ssp. *chrysanthemum*) が有効に記載されているが，ssp. *borchi* と ssp. *flavescens* は大屋 (1983) の分類にしたがいそれぞれ原名亜種の地域型と雌型とした．従って比較は下記の3亜種とした．

1) ssp. *paradisea* は原記載と現在もたらされている比較的少数の標本を使用．原記載地はフィニステレ山脈．これに含まれるセピック川北側の山塊に産するf. *borchi* は比較的多数の標本が存在する．2) ssp. *arfakensis* は原記載と現在もたらされている多数の標本を使用．産地の信憑性に関しても，亜種としての有効性に関しても問題なし．原記載地はニューギニア北西部のベラウ半島の西部アルファック山脈．3) ssp. *chrysanthemum* は原記載と現在もたらされている多数の標本を使用．産地の信憑性に関しても，亜種としての有効性に関しても問題なし．原記載地はニューギニア北西部のベラウ半島の西部のマノクワリ周辺の高標高でない地域．

新亜種の雄は全体的には ssp. *chrysanthemum* に似るが，同亜種との区別点としては，1) 前後翅の金緑色部分の色調がより緑色を帯びる，2) 後翅半透明黄金斑がより減退し4個になり，それぞれが翅脈上の金緑鱗粉により完全に広く分離する，3) 特に後翅7脈上は ssp. *chrysanthemum* では金緑鱗粉が少なく，第6, 7室の半透明黄金斑が融合しかかっている個体が大部分であるが，新亜種では同7脈上にも金緑鱗粉帯が幅広く形成され，第6, 7室の半透明黄金部が完全に広く分離する．他亜種との区別は添付の表を参照．

新亜種の雌は全体的には ssp. *arfakensis* に似るが，同亜種との区別点としては，1) 後翅中室の白斑を欠く，2) 後翅6室の亜外縁帯に黒褐色円形斑は出現しない，3) 腿節は黄色の鱗粉を具える．他亜種との区別は添付の表を参照．

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